Complete Title: Evaluating a Marketing Campaign to Increase Participation in School Meals

Short Title: Increasing School Meal Participation

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Introduction

The goal of these analyses is to examine whether parental exposure to a social media campaign encouraging school meal participation increases the frequency with which children eat school lunch and school breakfast. This analysis plan pre-specifies the analyses before collecting data and therefore serves as our ex-ante planned analysis.

Study Protocol

Participants will complete a randomized controlled trial. After providing informed consent, participants will take a baseline survey programmed in Qualtrics. At the end of the survey, participants will be randomized to 1 of 2 arms: 1) school meal campaign or 2) control campaign (focused on reading, a neutral topic unrelated to school meals). In the school meal campaign arm, participants will be asked to join a private Facebook group where they will view messages about the benefits of children eating school meals. In the control arm, participants will be asked to join a private Facebook group where they will view messages about the benefits of their children reading (a neutral topic unrelated to school meals). In both arms, researchers will post messages to the private Facebook groups approximately twice per week for 6 weeks. After the 6-week campaigns end, participants in both arms will take a follow-up survey programmed in Qualtrics.

Statistical Considerations

General Principles

Primary analyses will be intent-to-treat, including all randomized participants regardless of whether they joined a Facebook group or completed the follow-up survey. Depending on the proportion of participants who join the Facebook groups, we may consider conducting secondary, per-protocol analyses including only participants who joined a Facebook group.

We will use a two-sided critical alpha of 0.05 to conduct all statistical tests. All confidence intervals presented will be 95% and two-sided.

Outcome Measures

Table 1 describes the outcome measures.

Table 1. Outcome measures

Outcome	Description	Timing of Assessment
Co-primary outcomes		
Children's consumption of school lunches	Parental report of the usual number of days per week their child ate school lunch during the past month. Assessed with 1 item: "Thinking about the last month, how many days a week did your child usually eat school lunch?" This item will be scored on a 6-point scale from "0 days per week" (0) to "5 days per week" (5).	Collected in a ~10 minute survey at baseline and again at 6 weeks.
Children's consumption of school breakfasts	Parental report of the usual number of days per week their child ate school breakfast during the past month. Assessed with 1 item: Thinking about the last month, how many days a week did your child usually eat school breakfast?" This item will be scored on a 6-point scale from "0 days per week" (0) to "5 days per week" (5).	Collected in a ~10 minute survey at baseline and again at 6 weeks.
Secondary outcomes		
Campaign reactions		
Noticing the school meal campaign	Parental report of whether they noticed the school meal campaign. Assessed with 1 item: "In the last 6 weeks, have you seen any messages or advertising on Facebook encouraging children to eat school lunch or school breakfast?" Response options are "yes" (1) and "no" (0).	Collected in a ~10 minute survey at 6 weeks.
Number of school meals campaign topics recognized	Parental report of the number of topics they recognize having seen in messages about school meals. Assessed with 1 item: "Which of these topics did the messages discuss, if any? Check all that apply." Response options list 8 topics plus options for "none of these" and "not sure." Number of topics recognized will be calculated as the sum of all topics that parents indicate they have seen. Those who answer, "none of these" and "not sure" will be coded as recognizing 0 topics. Those who report not noticing the school meal marketing campaign will be coded as recognizing 0 topics.	Collected in a ~10 minute survey at 6 weeks.
Frequency of reading campaign messages	Parental report of the frequency with which they read their assigned campaign messages. Assessed with 1 item: "In the past month, how often did you read these messages?" This item will be scored on a 5 point scale ranging from "Never or less than 1 time per week" (1) to "Every day or more often" (5).	Collected in a ~10 minute survey at 6 weeks.

Outcome	Description	Timing of Assessment
Social interactions about campaign	Parental report of the frequency with which they talked to others about their assigned campaign messages. Assessed with 1 item: "In the last month, how often did you talk to others about these messages?" This item will be scored on a 5 point scale ranging from "Never or less than 1 time per week" (1) to "Every day or more often" (5).	Collected in a ~10 minute survey at 6 weeks.
Social interactions about school meals	Parental report of the frequency with which they talked to others about school meals. Assessed with 3 items (e.g., "In the last month, how often did you talk to others about school meals?"). Response options are on a 5-point scale ranging from "Never or less than 1 time per week" (1) to "Every day or more often" (5). Responses to the 3 items will be averaged to create a mean score.	Collected in a ~10 minute survey at 6 weeks.
Perceived benefits of school meals		
Perceived benefits of school lunch	Parental report of the benefits of their child consuming school meals. Assessed with 8 items (e.g., "My child eating school lunch helps my child do well in school"). Response options are on a 5-point scale ranging from "Strongly disagree" (1) to "Strongly agree" (5). Responses to the 8 items will be averaged to create a mean score.	Collected in a ~10 minute survey at baseline and again at 6 weeks.
Perceived benefits of school breakfast	Parental report of the benefits of their child consuming school meals. Assessed with 8 items (e.g., "My child eating school breakfast helps my child do well in school"). Response options are on a 5-point scale ranging from "Strongly disagree" (1) to "Strongly agree" (5). Responses to the 8 items will be averaged to create a mean score.	Collected in a ~10 minute survey at baseline and again at 6 weeks.
Knowledge that school meals are free		
Knowledge that school lunch is free	Parental knowledge that lunches served at their child's school are free to all students. Assessed with 1 item: "Are school lunches free for all students at your child's school?" Response options "yes" (coded as 1) and "no" or "not sure" (both coded as 0).	Collected in a ~10 minute survey at baseline and again at 6 weeks.
Knowledge that school breakfast is free	Parental knowledge that breakfasts served at their child's school are free to all students. Assessed with 1 item: "Are school breakfasts free for all students at your child's school?" Response options "yes" (coded as 1) and "no" or "not sure" (both coded as 0).	Collected in a ~10 minute survey at baseline and again at 6 weeks.

Outcome	Description	Timing of Assessment
Perceived healthfulness of school meals		
Perceived healthfulness of school lunch	Parental perception of the healthfulness of the lunches served at their child's school. Assessed with 1 item: "How healthy or unhealthy are the school lunches at your child's school?" Response options are on a 5-point scale ranging from "Very unhealthy" (1) to "Very healthy" (5).	Collected in a ~10 minute survey at baseline and again at 6 weeks.
Perceived healthfulness of school breakfast	Parental perception of the healthfulness of the breakfasts served at their child's school. Assessed with 1-item: "How healthy or unhealthy are the school breakfasts at your child's school?" Response options are on a 5-point scale ranging from "Very unhealthy" (1) to "Very healthy" (5).	Collected in a ~10 minute survey at baseline and again at 6 weeks.
Behavioral intentions		
Intentions to encourage their children's consumption of school lunch	Parental report of the likelihood of encouraging their child to eat school lunch in the next month. Assessed with 1 item: "In the next month, how likely are you to encourage your child to eat school lunch?" Response options are on a 5-point scale ranging from "Not at all likely" (1) to "Extremely likely" (5).	Collected in a ~10 minute survey at baseline and again at 6 weeks.
Intentions to encourage their children's consumption of school breakfast	Parental report of the likelihood of encouraging their child to eat school breakfast in the next month. Assessed with 1 item: "In the next month, how likely are you to encourage your child to eat school breakfast?" Response options are on a 5-point scale ranging from "Not at all likely" (1) to "Extremely likely" (5).	Collected in a ~10 minute survey at baseline and again at 6 weeks.
Barriers to participation		
Barriers to children's school lunch consumption	Parental report of the barriers preventing their child from eating school lunch. Assessed with 1 item: "What are some reasons that your child doesn't eat school lunch more often? Check all of the reasons that apply." Response options list 15 reasons plus "NA - my child eats school lunch every day or almost every day" and a free response option for "other." Total number of barriers selected will be summed. Those who report "NA - my child eats school lunch every day or almost every day" will be coded as having 0 barriers.	Collected in a ~10 minute survey at baseline and again at 6 weeks.

Outcome	Description	Timing of Assessment
Barriers to children's school breakfast consumption	Parental report of the barriers preventing their child from eating school breakfast. Assessed with 1 item: "What are some reasons that your child doesn't eat school breakfast more often? Check all of the reasons that apply." Response options list 16 reasons plus "NA - my child eats school breakfast every day or almost every day" and a free response option for "other." Total number of barriers selected will be summed. Those who report "NA - my child eats school breakfast every day or almost every day" will be coded as having 0 barriers.	Collected in a ~10 minute survey at baseline and again at 6 weeks.
Food insecurity		
Household food insecurity	Parental report of household food insecurity. Assessed with 6 items (e.g., "In the last month, were you ever hungry but didn't eat because there wasn't enough money for food?") Response options include "no" or "yes"; "never true", "sometimes true", or "often true"; "only 1 or 2 days," "some days but not every day," or "almost every day." Responses of "often" or "sometimes" and "yes" are coded as affirmative (yes). Likewise, responses of "almost every day" and "some days but not every day" are coded as affirmative (yes). The sum of affirmative responses to the six questions in the module is the household's raw score on the scale. Household food security status is assigned as follows: Raw score 0-1—High or marginal food security Raw score 2-4—Low food security Raw score 5-6—Very low food security Analyses will dichotomize households into those with high or marginal food security and those with low or very low food security.	Collected in a ~10 minute survey at baseline and again at 6 weeks.

Outcome	Description	Timing of Assessment
Child food insecurity	Parental report of child food insecurity. Assessed with 8 items (e.g., “In the last month, did you ever cut the size of your child's meals because there wasn't enough money for food?”) Response options include “no” or “yes”; “never true”, “sometimes true”, or “often true”; “only 1 or 2 days,” “some days but not every day,” or “almost every day.” Responses of “often” or “sometimes” and “yes” are coded as affirmative (yes). Responses of “almost every day” and “some days but not every day” are coded as affirmative (yes). The sum of affirmative responses to the 8 questions in the module is the child’s raw score on the scale. Child food security status is assigned as follows: Raw score 0-1—High or marginal food security among children Raw score 2-4—Low food security among children Raw score 5-8—Very low food security among children Analyses will dichotomize households into those with children with high or marginal food security and those with children with low or very low food security.	Collected in a ~10 minute survey at baseline and again at 6 weeks.

Data Preparation

To prepare the data, we will examine all scales to ensure they achieve adequate internal consistency (Cronbach's $\alpha>0.70$), dropping items as needed to improve internal consistency. If we are unable to achieve adequate internal consistency by dropping items, we may exclude the unreliable scales from analyses (e.g., not analyze treatment effects on these outcomes).

Statistical Methods

1. Analyses of the co-primary outcomes:
    a. We will use mixed effects regression models to **evaluate the effect of the school meals campaign on children's school lunch consumption and children's school breakfast consumption.** In separate models for lunch and breakfast, we will regress usual number of school meals eaten per week on an indicator variable for trial arm (school meal campaign vs. control), an indicator variable for time period (baseline vs. follow-up) and the interaction between trial arm and time period. The treatment effect is given by the coefficient on the interaction term. We will consider linear or Poisson models, based on the distribution of the outcome and model fit. We will treat the intercept as random to account for repeated measures within participants and will include state fixed effects.
    b. To **examine the potential differential effects of the school meals campaign by demographic characteristics**, analyses will examine whether the effect of the school meals campaign on children's school lunch consumption and children's school breakfast consumption is modified by household income ($\leq$ vs. >185% Federal Poverty Level) or parent's race/ethnicity (with categories determined based on distribution of race/ethnicity in the sample). We will test for effect modification by adding to the primary model three-way interactions (i.e., difference-in-difference-in-differences) between trial arm, time period, and variable(s) for the potential effect modifier, using separate models for each outcome (school lunch consumption and school breakfast consumption) and effect modifier (income and race/ethnicity).

2. Analyses of the secondary outcomes:
    a. We will use a similar mixed effects regression approach to **evaluate the effect of the school meals campaign on secondary outcomes** (e.g., perceived benefits of school meals, knowledge and attitude about school meals, behavioral intentions, perceived barriers to school meal participation, and food insecurity). We will use mixed effects logistic regression for binary outcomes, mixed effects linear regression for continuous outcomes, and mixed effects Poisson regression for count outcomes. We will treat the intercept as random to account for repeated measures within participants. For outcomes measured only at follow-up (e.g., noticing), we will use linear, logistic, or Poisson regression.

Sample Size Needs

We estimated power using G*Power 3.1.[1] No published studies have examined the effect of parent-directed school meal marketing campaigns on children's school meal consumption,[2] so we powered to detect a small standardized effect (Cohen's f=0.05, equivalent to d=0.10).[3] We assumed 75% of the initial sample of 800 parents would complete the follow-up survey (similar retention to a previous study using similar methods[4]), yielding an analytic sample of *n*=600. Assuming alpha=0.05 and a correlation among repeated measures of 0.60 (based on prior research[5]), a sample of this size would yield 80% power to detect an effect of school meal campaign on consumption of school lunch and consumption of school breakfast of f=0.05 or larger. Our prior studies with parents suggest that messaging interventions are likely to yield effects of this size or larger.[6-8] Additionally, studies of child-directed school meal marketing campaigns[9] and multicomponent interventions that include marketing[10,11] suggest effects of this size are reasonable.

Exclusions and Outliers

We will exclude participants who do not consent or do not complete the baseline survey, as these participants will not be randomized. Primary analyses will be intent-to-treat, including all randomized participants regardless of whether they join their assigned Facebook group or complete the follow-up survey. We will also consider conducting a secondary analysis per-protocol, examining only those who joined their assigned Facebook group and completed the follow-up survey.

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